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AUTHOR Stacks, Don W.; Andersen, Peter A.
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ABSTRACT

To further the understanding of how the brain operates at the most basic level of interest to human communication theorists, intrapersonal communication, this paper reviews the arguments against the hemispheric dominance theory and for a neurological processing style model of brain functions and then focuses on the impact of the corpus callosum (a thin band of fibers which coordinate the functions of the two hemispheres) as a feature of communication within the brain itself. Topics covered in the paper include the following: (1) the two competing perspectives on the brain--the simple left-brain right-brain view and MacLean's triune brain (reptilian, paleomammalian, and neomammalian); (2) assessment of the intrapersonal communication system by beginning at the preverbal stage; (3) the role of the brain in understanding intrapersonal communication processing; (4) modularity of brain function and intrapersonal communication; (5) interhemispheric cooperation; and (6) interhemispheric dissonance. The paper concludes that intrapersonal communication should not be regarded as either oxymoronic or all-inclusive, because the communication among brain modules--where modules may or may not interact, exert control over one another, compete, or cooperate--is indeed a form of intrapersonal communication. Seven pages of references, a table of brain functions and structures, and a diagram of the triune brain conclude the paper. (SKC)

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TOWARD A HOLISTIC NEUROPHYSIOLOGICAL UNDERSTANDING OF INTRAPERSONAL COMMUNICATION

Don W. Stacks

Department of Speech Communication

The University of Alabama

Tuscaloosa, AL

and

Peter A. Andersen

Department of Speech Communication

San Diego State University

San Diego, CA

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TOWARD A HOLISTIC NEUROPHYSIOLOGICAL UNDERSTANDING OF INTRAPERSONAL COMMUNICATION

The human brain has captivated and perplexed scholars in the biological and social sciences for many decades. In particular, studies of the hemispheres of the cerebral cortex began to unlock some of the fundamental mysteries of the human experience. For more than 100 years these studies focused on the "dominant" left hemisphere, the repository of language, our most human achievement. By the late 1960's and through the mid-1970's the mysteries of the right hemisphere's role were also being explored. Studies established the right hemisphere's role as "dominant" for many, largely nonverbal functions. These views of the brain emphasized a dominance perspective; quite simply, the brain was divided into control centers, each representative of major functioning. Hence, we saw language as a function of the brain's left hemisphere, nonverbal communication a function of the right hemisphere, and motor functioning of the right side of the body controlled by the left hemisphere and left side functioning by the right hemisphere.

By the late 1970's, however, the brain was observed to work as an organized whole. The notion of an "holistic" brain evolved, a brain which required inputs from both hemispheres to process and ultimately interpret the world surrounding its owner. At about this same time communication researchers began to express interest in the processing abilities of the brain. Their intent was to understand how and why the human being communicated and the nature of the message systems underlying communication. Theorizing and experimentation began to yield a slightly different interpretation of human communication. This view incorporated both biological functioning perspectives with the potential

psychological impact of how the type of information being processed might alter that processing itself.

An outgrowth of this line of thought presents a brain composed of various modules, centers, or stages, each interdependent upon the other for processing. No longer was the parsimonious right-brain/left-brain argument advanced by the "dominance" proponents adequate to fully explain communication processing. This new perspective emphasized the style or specialization of processing associated with particular parts of the brain and the impact of how that style influenced both processing paths and interpretation of events. Research from a variety of disciplines pointed to the importance of understanding how the brain "communicated" with itself as the beginning point of communication, a process referred to by Stacks and Sellers (1984) as the study of "neurocommunication."

The purpose of this paper is to further our understanding of how the brain operates -- processes and interprets the information it receives -- at the most basic level of interest to human communication theorists, intrapersonal communication. We will begin with a short review of the dominance arguments, the style arguments, and then focus attention primarily on the impact of the corpus callosum as an important feature of communication. In do so we will examine what Stacks (1983) has labeled the "preverbal stage" of communication.

The Brain: Two Perspectives

We cannot begin our analysis of the intrapersonal implications of the brain without first examining it as an organ. The brain of the human being is a complex organ, more complex than originally thought. Most representations present the brain as two-parted but with various

"areas" responsible for certain functioning. Hence, we have a left side or hemisphere and a right side or hemisphere. The left and right hemispheres are connected at various depths of the brain by commissures or paths. The major connector of the hemispheres, however, is the corpus callosum, a thin band of fibers which coordinate the functions of the two hemispheres.

The hemispheric styles and functions of both hemispheres have been discussed in some detail by P. Andersen, Garrison, and J. Andersen (1979), Stacks (1983), and Stacks and Sellers (1986). In general, the left hemisphere is primarily responsible for the logical, analytical, and social interpretations of incoming information. The right hemisphere is responsible for the more emotive and holistic interpretations of that same information. Assuming normal functioning, both hemispheres receive their information from the various senses, with sight and hearing the most conscious of the communication-related senses. Information is processed rather quickly by the right hemisphere (cf., Shedletsky, 1981, 1983) and passed on to the left hemisphere rapidly where "final" interpretations are made and communication is consummated.

Control over verbal communication, that which is exhibited through "language," resides in the left hemisphere. This does not mean, however, that verbal communication is a function of the left hemisphere alone. As a number of researchers have observed, the right hemisphere has the potential for language, albeit a more rudimentary and less conscious form of language (P. Andersen, Garrison, & J. Andersen, 1975, 1979; Ardila, 1984; Bogen, 1969b, 1975; Buck, 1982; Cummings, 1985; Sellers & Stacks, 1985, in press; Stacks, 1983; Stacks & Dorsey, in

press; Stacks & Sellers, 1986). Behavioral evidence presented by Stacks and Sellers (1986) reinforces both the existence of right hemispheric language and its impact on the total communication system.

This simple model of the brain also has been challenged. Paul MacLean (1969, 1972, 1973, 1977) argued the brain as a more complex organ, one still influenced by visages of its evolutionary past. MacLean argues for a Triune Brain, a brain composed of three evolutionary brains, each responsible for different processing and interpretation functions (see Figure 1 and Table 1). MacLean offers both behavioral and physiological evidence for the existence of all three brains. Stacks (1983) also suggested that communication functioning principles can be derived from MacLean's model, a concept we will explore more later.

Insert Figure 1 and Table 1 About Here

In MacLean's model we find an extremely primitive brain located at the base of the brain stem and responsible for automatic, survival, functioning. This he labeled the R-Complex, or Reptilian, brain. Surrounding the R-Complex brain is the brain of early man, the Paleomammalian brain. The Paleomammalian brain comprises what has been labeled the limbic system and is responsible for emotional processing and imaging. Surrounding this brain is the most evolved and complex brain: the Neomammalian brain. The Neomammalian brain, or neocortex, is responsible for advanced imaging, logic, and "thought." This is the brain responsible for language.

In MacLean's model control over functioning and interpretation is seen as "top-down." That is, in normal processing the Neomammalian brain controls inputs from the Paleomammalian brain, which, in turn, has control over the inputs from the R-Complex brain. Processing, however, is "bottom-up," with information received and processed from most primitive to most recent brain. In this way interpretations are made based first on survival, then association, and finally according to the "rules" or logic of society. In abnormal situations lower brain input may "short-circuit" the control observed by more advanced brains. Hence, we might react to a situation through defensive (R-Complex) actions without thinking, we might blush at an inappropriate joke (Paleomammalian), or we might regain control and stop an action (mask the behavior) before it actually occurs, although the "instructions" may well have been already sent to the appropriate motor centers.

It should be noted that other evolved species have this same three-brain structure (Brown, 1977, 1978). What distinguishes the human brain is the asymmetrical nature of its processing. The two brain hemispheres and their stylistic functions alter how we process and interpret information. Hence, we have six different brains, each with a particular functioning and interpretation style. The process of interaction among and between the six brains creates the structure for the "mind," an abstraction referring to the processing of information in such a way as to make sense out of the world in more than a simple "input-output" system. The mind also "humanizes" human communication by making the "normal" human responsible for his or her actions. As we shall see, however, responsibility must be mediated by hemispheric style and control.

Consider, for instance, the interplay of style and biological functioning. Stacks (1982) illustrated the processing and interpretation problems associated with a disagreement. He argues that when two people engage in intense argument the distances between the combatants should decrease (an ethological argument, see: Burgoon & Saine, 1978; Hickson & Stacks, 1985):

> logic would suggest that verbal assault should end with increased, not decreased space. However, if the impact of the argument causes an inhibition of the passage of information from the right hemisphere (resulting in control of the situation passing to right hemispheric dominance) and the short-circuiting of the Neomammalian brain's control over the Paleomammalian, then the decreasing space might be a cue of increased tension, loss of control, and possibly even reversion to the R-Complex defense of territory, and nonlogical behaviors which might then follow (Stacks, 1982, pp. 13-14).

The role of the biological organ we refer to as the brain, then, is mediated according to psychological reaction to the information it receives. This mediation occurs at all times at the Neomammalian level, probably frequently at the Paleomammalian level, and, although with much less frequency, at the R-Complex level. It is this interplay of right and left hemispheres across the three brains which creates what we call intrapersonal communication. The next section examines the beginnings of the intrapersonal communication system, the interrelation and interdependence of the various brain modules, or the various storage centers which must be accessed to make sense out of the world (Gazzaniga, 1985).

Assessing the Intrapersonal System: Beginning at the Beginning

All communication begins at some point and time. We can think of this beginning point as existing prior to any cognitively-based

interaction we might have, beginning with the innately stored materials from which we will act and react. Stacks (1983; Stacks & Sellers, in press) has posited that intrapersonal communication systems begin at a preverbal stage or level. In the beginning the preverbal stage serves as a loading mechanism for the individual's first experiences with communication, at or before birth. After birth the preverbal stage becomes the most elemental subsystem within the larger communication system. That is, the preverbal serves to "evaluate and interpret the situation and responses at the other levels [interpersonal, small group, mass]. . .[they] exert. . .pressure on how that person will communicate (or choose not to communicate)" (Stacks, 1983, p. 41).

The preverbal, then, is the essence of intrapersonal communication. It serves to establish the intrapersonal system, operating as a storage center for such concepts as attitudes, values, scripts, goals, plans, and beliefs; concepts which make us human. At its earliest, the preverbal consists not of language and cognition, instead it consists of drives, forces, and modules which will later fill, empty, refill, change, become more important, less important as the individual interacts with others and him- or herself.

The existence of the preverbal stage establishes a cognitive system which becomes the "self." As Gazzaniga (1985) noted in an analogy between the self and a tightly knit federation of governments:

> A cognitive system composed of mental modules, each one of which could act independently from the other but all together forming a mental federation [self, self-concept], would be most likely to assign to one cognitive system the chore of establishing and maintaining a theory about the federation's actions. Part and parcel of the process would be the necessary concept that the organism was acting freely, that in fact the organism was governable (p. 146).

Gazzaniga's point is that the brain is composed of a variety of parts, or modules, each capable of thoughts, cognition, and memory with the power to produce change in the way in which the whole brain operates. This position is similar to the one introduced earlier, the brain is interdependent upon its various brains or subsystems.

The preverbal level establishes a sense of order to that "federation" of brains. It acts to fill an initial void with information received at birth, perhaps even prior to birth (Stacks, 1983). Understanding how the preverbal functions requires that we take a short trip through three highly interrelated yet diverse perspectives on human behavior. First, we look at behavioral-cognitive-gestalt theory, which points to innate drive or motivation, then we switch to psychoanalytic theory, which posits an interaction of conscious and unconscious desires and repression of those desires. From the psychoanalytic we then move to the neurophysiological and try to combine all together to understand how the brain becomes the mind.

From the view of the behavioral-cognitive-gestaltist school the preverbal exists to (1) establish the initial motivations or drives from which we behave and (2) behave in some predictable manner consistent with external (behavioral) or internalized (cognitive-gestaltist) external stimuli (Stacks, 1983). Specifically:

> The contributions of the preverbal stage from this diverse perspective suggest that (1) we possess a need (drive) to organize the environment around us either in terms of how it affects the connection between stimulus and response or how it affects cognition, (2) we are motivated in predictable ways to behave, and (3) external stimuli activate internal states (either as cognitions or as intervening variables) that may be arranged in some form of structure. We operate or communicate on an approach/avoidance or reinforcement system that can be internalized (ie., we do not necessarily need to be reinforced, and, from the more cognitive perspectives, we can internalize these approach/avoidance

> tendencies in terms of concepts; we can create our own reinforcements) (Stacks, 1983, p. 46).

At the intrapersonal level, then, we can interpret our actions based on environmentally-induced actions, conscious or unconscious of the actual stimulus itself. Or, we can examine the habits we have consciously or unconsciously learned from others. Or, we can examine the contributions of subconscious action which may then influence the behavioral.

Obviously, the psychoanalytic connection is present; it may be that Freud (1943) was thinking of the intrapersonal system specifically when he posited the existence of innate and instinctive stimuli residing in the self. As Stacks (1983) noted of this "internal drive":

> the structure of the conscious and subconscious (unconscious) offers an implication that part of our communication may be influenced by an innate or instinctive part of our make-up. The unconscious may act as the initial "storage" structures that, through the actions of the preconscious on the conscious, causes us to change our feelings, attitudes, beliefs, and values in more or less predictable ways. . .that from some initial structure(s) we build a semantic world from which to rationalize behaviors that do not have external or cognitive stimuli. The structure(s) then act as the initial "loading" and "reloading" centers for communication (p. 50).

Intrapersonal processing then can be redefined as relating to Freud's concepts of id, ego, and superego, which serve as internal drives. The behavioral-cognitive-gestaltist contributions also point to a need for some initial processing module, a place where initial evaluations are prepared and then modified by "new" information received from the environment.

Gazzaniga's mental modules are similar to Stacks' preverbal structures in several ways. First, such modules are capable of independent cognitive activity (Gazzaniga, 1985). Second, each module is capable of receiving and processing external information. Finally,

modules are capable of intrapersonal communication to provide us with unified cognitions and behavior.

The Role of the Brain in Understanding Intrapersonal Communication Processing

The concept of "intrapersonal communication" has received mixed reviews from the academic community studying human communication. For one group of scholars, the concept has stimulated research and theory about internal processes of communication and the mental and physiological antecedents of interpersonal communication. An SCA commission dedicated to its study has thrived. For others, the very term intrapersonal communication is an oxymoron. For yet a third group, some processes should be regarded as "intrapersonal" while other processes should be excluded from its domain. In any case, little has changed since P. Andersen, Garrison, and J. Andersen (1975) stated, "The definitional concept of intrapersonal communication has ambiguous, confusing, and contradictory attributes ascribed to it by communication scholars. . ." (p. 13). More recently Barker (1986) has distinguished between "intrapersonal behavior" and "intrapersonal communication;" Cunningham (in press) has also differentiated "intrapersonal processes" from "intrapersonal communication." These two alternative terms are considerably broader than intrapersonal communication, which references a smaller subset of behavior.

More than a decade ago, P. Andersen, Garrison, and J. Andersen (1975) defined intrapersonal communication as "the transmission of sensory and motor information between the right, nonverbal hemisphere of the brain and the left, verbal hemisphere of the brain" (p. 13). The transmission of information between the left and right hemispheres, they

argued, is the role of the corpus callosum. The discussion of intrapersonal communication which follows is consistent with the above definition. Recent neurophysiological research on brain modules, however, requires one small modification in this position.

Modularity and Intrapersonal Communication

A number of researchers in the neural sciences have developed a modular theory of brain functioning. One leading proponent is Gazzaniga (1985) who states "the data suggest that the brain is organized in such a way that information is stored in modules. These modules can compute, remember, feel emotion, and act" (p. 86). Later he suggests research reveals that "Brain modularity is not just a psychological concept. Through studies such as this, it becomes clear that modularity has a real anatomical basis" (p. 128).

Each human brain contains a number of modules, though estimates of the exact number vary from researcher to researcher and the number may even vary from person to person. It is generally agreed that each module is fully capable of cognition and thought. Future intrapersonal communication research should examine these intermodular communication processes which are distinct from "thinking" and, in our opinion, constitute excellent candidates for genuine intrapersonal communication. Indeed, as neurological research on brain modules proceeds, intermodular interaction should become an important topic for both neurophysiologists and intrapersonal communication researchers.

Brain modules are hierarchically organized into the two cerebral hemispheres. E. Zaidel (1985a) suggested that "the cerebral hemispheres are central superprocessing modules" (p. 395). Thus, a study of intermodular communication can begin with the intrapersonal messages

exchanged between the two cerebral hemispheres. E. Zaidel (1985b) suggested that the two hemispheres "have sharp anatomic boundaries and some apparently sharp functional demarcations as well. The interaction between hemispheres thus becomes a paradigm case for information transfer within the cognitive-cerebral network" (pp. 54-55).

Indeed, for years researchers in communication and the neural sciences have conducted research employing the terms interhemispheric communication (P. Andersen, Garrison, & J. Andersen, 1975; Bogen, 1969a, 1985; Gazzaniga & LeDoux, 1978), communication between the brain hemispheres (P. Andersen, Garrison, & J. Andersen, 1975; D. Zaidel, 1985), hemispheric interaction (TenHouten, 1985), interhemispheric cross-callosal interaction (E. Zaidel, 1985b), and cross-talk between the right and left hemispheres (Sperry, 1985). As P. Andersen, Garrison, and J. Andersen (1975) noted, "All the necessary components of a communication situation are present [in the brain]. Messages are transmitted by a source (one hemisphere) through a channel (corpus callosum) and to a receiver (the other hemisphere)" (p. 13). The corpus callosum and, to a less degree, the anterior and forebrain commissures, are the channels through which intrapersonal communication occurs. This we would argue <u>is</u> the essence of intrapersonal communication and its functioning is to prepare the individual for communication with his or her environment and/or other people. It is important to underscore that interhemispheric communication is not synonymous with <u>thinking</u> since modules and hemispheres can "think" independently. <u>It is the transmission of messages between hemispheres or modules that is a distinct intrapersonal communication process.</u>

What do we presently know regarding the process of interhemispheric communication? One expert suggested "As yet, little is known about the nature of normal cross-callosal interhemispheric communication" (E. Zaidel, 1985b, p. 57). Nonetheless, in the interest of stimulating future research and theory we will present a few ideas that may elucidate the interhemispheric communication process. In a metaphorical sense brain modules and hemispheres behave much like individual interpersonal interactants in everyday communication; they inhibit, struggle for control, compete, cooperate, facilitate, create paradoxes, coexist, and promote harmoniousness.

Interhemispheric Cooperation

Like healthy interpersonal relationships, cooperation between the brain hemispheres has been shown to have a number of benefits. Research has shown, "The more complex a task is, the more likely it is to involve interhemispheric interaction" (E. Zaidel, 1983, p. 122). Annett (1985) similarly argued that, "Normal human intellectual activity depends on the cooperative function of both cerebral hemispheres, not on just one. there is considerable evidence from experimental psychology that the integrated use of two hemispheres is better than one" (p. 154).

Recent research has examined how the two hemispheres cooperate during the processing of verbal communication. While the left hemisphere is primarily responsible for processing verbal communication, it should be understood by now that both brain hemispheres possess the capacity for language. Both contribute to the final action and "color" the intent of the situation. How each hemisphere contributes to the final action is the function of intrapersonal communication at the

neurological level. This contribution we argue is an interaction of hemispheric function and style.

In normal verbal communication situations the left hemisphere is truly "dominant." This is the outcome of a logical process dependent on societal mores, rules, and laws. It is the right hemisphere which provides an analysis of how far the situation is from the "norm." Research has shown that when communication is less than "normal" or familiar the right hemisphere becomes more involved (E. Zaidel, 1985b).

Clinical research has demonstrated that the two brain hemispheres frequently cooperate. Research on split-brain patients indicates that when the left hemisphere must interpret a message without right hemispheric input (through a severing of the corpus callosum), that message is interpreted literally; without an analysis of the underlying emotional content or imagery required for a total understanding of the message (Bryden & Ley, 1983). Likewise, Stacks (1982, 1983; Hickson & Stacks, 1985) noted a similar occurrence with children just learning their language. He suggested that children focus on literal meaning and the rules of grammar which forces left hemispheric interpretations. Several previous studies have found children generally fail to detect nonverbal vocalic communication including sarcasm (J. Andersen, P. Andersen, Murphy, & Wendt-Wasco, 1985; Blanck & Rosenthal, 1982). Stacks (1982, 1983) noted the difficulty in conveying sarcastic messages to children under the age of six or seven (after which they have "neuromatured" and can integrate the information from both hemispheres of the brain). Moscovitch (1983) suggested tasks requiring processing of "high imagery" or "highly affective" thought results in a right hemispheric "priming" function being activated. This "priming" is a

primary function of normal intrapersonal communication which serves to promote interhemispheric cooperation.

Stacks and Sellers (1986) have argued that "normal" processing occurs in such a manner that the left hemisphere can, under "normal" circumstances, basically operate alone. They argue that when stimuli are presented in a logical and nonintense manner the left hemisphere's ability for logic allows normal processing. However, when the stimuli are novel or arousing (established by past experience and societal mores), input from the right hemisphere becomes a necessary condition for correct interpretation.

Stacks and Sellers (1986) demonstrated this by presenting persuasive messages to one and only one hemisphere of the brain and asking people to rate the persuasiveness of the messages.[1] In early testing they employed the "normal" persuasive message; a message of moderate language intensity and metaphorical composition. Stacks and Sellers failed to find differences in message or source acceptance. Why? Simply put, the topic (legalization of heroin) was not novel enough to bring into play the right hemisphere and the message stylistically was left-hemispherically preferred, as are most effective logical messages. They then changed the message from moderately intense to highly intense. The results were both theoretically in line with right hemisphere input and quite striking. Both message and source were perceived differently. When the message was sent to the right hemisphere normal high intensity results were obtained, the message and source was rejected. However, when the left hemisphere received the same message, message was evaluated significantly higher and the source seen as more credible.

What happened? The left hemisphere, which would normally receive the right hemisphere's input via the corpus callosum as it analyzed the logic of the message, had to rely either on its own analysis of the message or, and from a processing perspective the only way it could make "sense" of the message, transmit the message with its interpretation to the right hemisphere for interpretation. In conducting the study Stacks and Sellers noted that participants in the left hemisphere condition took longer to complete the study than those in the right hemisphere condition. Obviously, follow-up physiological indices are necessary to correlate the behavioral with the cognitive, studies now in the planning stages.

How does this study aid our understanding of intrapersonal neurological processing? Quite simply, it demonstrates that (1) both hemispheres understand and process some language, (2) that each hemisphere has a particular function in the processing of that language, and (3) that the two hemispheres "communicate" with each other. In the case of processing, the right hemisphere serves an important function in establishing deviations from the base-line for "normal" communication. When the left hemisphere can process stimuli alone, we get normal reactions. When the stimuli are outside the accepted (created) norms, the right hemisphere's operation is to "prime" the left hemisphere for interpretation (cf., Bryden & Ley, 1983; Moscovitch, 1983; Stacks & Sellers, in press). That priming occurs via the corpus callosum.

Other researchers have established additional benefits of interhemispheric cooperation. TenHouten (1985) reviewed research which showed that creativity is lacking in commissurotomized patients. They fail to verbally express fantasies, symbols, insights, or feelings. One

hypothesis is that the separation of the hemispheres blocks the right hemisphere's insights and images from being verbally expressed by the more linguistic left hemisphere.

Similarly, dialectic thinking probably involves the cooperation of both hemispheres. Dialectic thinking requires that two modes of thought be viewed as simultaneously complementary and contradictory, united and opposed, synthetic and antithetical. TenHouten (1985) maintained:

> the dialectics of hemispheric interaction also imply a complementarity between the hemispheres. This does not mean that more proficiency is developed in both modes, so that a person can carry out tasks with one and tasks with the other. Dialectical thinking, as complimentary, means that both appositional and propositional thought are brought to bear on one problem (pp. 344-345).

Interhemispheric Dissonance

What happens if two modules or hemispheres come to opposite conclusions regarding a belief, attitude, or course of action? Is this internal conflict resolved intrapersonally and, if so, how? Examination of intrapersonal communication processes involving competition among modules or hemispheres may provide an answer. Festinger's (1957) cognitive dissonance theory and its descendants has been one of the most developed models of consistency and change in the social sciences.

Gazzaniga (1985) maintains that conflicts among brain modules may provide a physiological substrate for dissonance theory which has been confirmed at heretofore only cognitive levels. We maintain that once different modules or hemispheres have come to conflicting conclusions two possibilities could occur. Either the conflict could remain unresolved, resulting in conflictual, disorganized, and fragmented behavior or the conflict can be resolved through a dissonance reduction process. Gazzaniga (1985) proposes that dissonance occurs:

> because our brains are organized in terms of independent modules each capable of action. . . One implication is that one value of the brain being organized the way I propose [modules] is that it allows for constant testing and retesting of our beliefs. The responding exploring human being will have a higher probability of constantly reevaluating his or her beliefs. . . If the brain were a monolithic system with all modules in complete internal communication, then the value we place on our beliefs would never change. The culture would be doomed to repeat the cant of its preceding generations in a reflexlike manner (p. 139).

Experiencing dissonance and its subsequent reduction may be a beneficial process. If no dissonance were experienced, no change would be possible. If there were no way for resolution or dissonance reduction, mental confusion and disarray would predominate. The human brain may be constructed for this process to prevail.

Indeed, it has been suggested that the inability to conduct interhemispheric interaction may be highly dysfunctional. Dimond and his associates (Beaumont & Dimond, 1973; Dimond & Beaumont, 1974; Dimond, Scammell, Bryce, Huws, & Gray, 1979) report that schziophrenics display defective interhemispheric information transfer. This and other psychopathologies and behavioral disorders may be the result of poor interhemispheric communication (see: Beaton, 1985).

Recently, structural or chemical explanations for schizophrenia rather than social explanations have gained wide acceptance. However, temporary reactive schizophrenia may be induced through communication. Bateson, Jackson, Haley, and Weakland (1956) suggested that schizophrenia was the result of double-binding (contradictory) verbal and nonverbal messages. This would produce different conclusions in the left (verbal style) and right (nonverbal style) hemispheres of the receiver. Watzlawick (1978) suggested that this situation produces schizophrenia or psychosis. He stated that one response to incompatible

verbal and nonverbal depictions of reality may be that, "One hemisphere inhibits the other and thereby gains control of the efferent pathways. This amounts to a repression of the contradictory perception. The price to be paid for this solution is a massive falsification of reality" (p. 37). While social causes of schizophrenia have not been established, this hemispheric inhibition hypothesis deserves more attention.

What other ways would poor interhemispheric communication cause problems? A rich body of literature has focused on the pathological brain and communication (see: P. Andersen, Garrison, & J. Andersen, 1975, 1979; Segalowitz, 1983; Sperry, 1985; Stacks, 1982, 1983). Some have argued that even the normal brain will dysfunction or "short-circuit" at times (e.g., Galin, 1975; MacLean, 1973, 1977; Stacks, 1982, 1983). Galin (1975) notes, for instance, that one hemisphere of the brain may temporarily inhibit or "block" corpus callosum processing through a massive neural charge originating from one hemisphere or the other. If that charge were to originate in the right hemisphere, communication may be acted upon based on both the primary function and style of the "controlling" hemisphere.

How might such an event happen? Sellers and Stacks (1984) note that communication apprehension may be approached from a neurological processing perspective related to the intrapersonal communication system. Recently, it has been argued that:

> reaction to both the situation (communicating in public) and the interpretation of the situation interact to create a negative perception of the event. As the apprehensive person labels the situation with strong negative emotion, the processing may begin to break down with possible neural activity in the corpus callosum blocking the flow of information between hemispheres and a possible "reaction" to the situation occurring out of kilter to the actual situation. . .in extreme cases the apprehensive speaker will not remember the communication at all, suggesting a right-

> hemispheric interpretation (Stacks & Seller, in press, pp 29-30).

Other examples include changes in personality after exposure to extreme stimuli, and, even more serious, the ability of the left hemisphere to take those extremes and make them "normal." One has only to look at the psychology of propaganda and the preparation of men for war to see how that could be and is accomplished.

It is likely that one hemisphere may routinely inhibit the other from participation in tasks consistent with the hemisphere's style or function. Indeed, Beaton (1985) maintained that the corpus callosum actually serves to establish lateralization of function. Unfortunately, at times the wrong hemisphere may be inhibited reducing competence at a given task. E. Zaidel (1985c) provided evidence that priming the appropriate hemisphere may "decrease cross-callosal inhibition of the opposite hemisphere, thus improving the performance of tasks that are optimally performed by one hemisphere alone" (pp. 321-313). Watzlawick (1978) describes in detail a variety of therapeutic techniques which involve a temporary blocking of the left hemisphere and its corresponding style of logic and verbalization. These include such practices as the confusion technique, paradoxical injunctions, and false alternatives.

Conclusion

Intrapersonal communication should not be regarded as either oxymoronic nor all-inclusive. The practice of including every form of psychological and physiological activity under the rubric of intrapersonal communication has led some scholars to disregard all intrapersonal research. Neither extreme is acceptable. While establishing the scholarly parameters of the concept, intrapersonal

communication, is beyond the scope of this paper, we have outlined processes which we believe to be one genuine form of intrapersonal communication.

Communication among brain modules, particularly those super-processing modules, the cerebral hemispheres, should be studied as intrapersonal communication. Like people, modules may or may not interact, may exert control over one another, may compete or cooperate. This paper has shown how the process of intermodularity, particularly interhemispheric communication, has implications for cognition, speech, persuasion, attitude theory, nonverbal communication, message intensity, creativity, dialectic theory, dissonance theory, mental disorder, communication apprehension, and therapy. Future research will determine if understanding interhemispheric interaction as a form of intrapersonal communication can really serve to explain these diverse processes.

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Footnotes

[1]Stacks and Sellers (1986) manipulated reception through a clinical process whereby "white" noise is used to "mask" one ear (Manning, 1980) from receiving either a message through either normal acoustic transmission or through sound conductance via facial bone.

Table 1

FUNCTIONS, FOCUS, AND STRUCTURES OF THE HUMAN BRAIN

BRAIN:		MOTIVATIONAL LEVEL:*
NEOMAMMALIAN		
Function/Focus:	Relationships between Internal and External World, Words/Information, Experience, Images, Novelty	Esteem
Right Hemisphere	Left Hemisphere	
Space	Logic	
Patterns	Verbal	
Holism	Intellect	
Association	Transformation	
Imaging	Time	
Connotative	Denotative	
"Forrest"	"Trees"	
PALEOMAMMALIAN		
Function/Focus:	Sound, Taste, Smell, Touch, Emotion Love, Hate, Morality, Family, Passion, Values, Play	Belonging
R-COMPLEX		
Function/Focus:	Survival, Safety, Ritual, Repetition, Food-gathering, Territoriality, Reproduction, Regularity, Defense	Safety

*After Maslow (1954).

FIGURE 1

MACLEAN'S TRIUNE BRAIN*

*After MacLean (1973)